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Rev. 07/10/02

17776/---00010

ESD

EPA REGION III QA DIRECTIVES

HWMD

Bulletin No. QAD009 Date: April 23, 1990

FIELD FILTRATION POLICY FOR MONITORING WELL GROUNDWATER SAMPLES REQUIRING METALS ANALYSIS

The objectives of this directive are: (1) to formally state Region III RCRA and CERCLA policy which requires both filtered and unfiltered groundwater samples for metal analyses; (2) to outline appropriate exceptions to the state[d] policy, and (3) to provide technical direction for the field filtration procedure.

[illegible] single copy of this directive is provided to the individual designated to represent the contractor. It is the responsibility of that individual to distribute the directive within the contractor organization to appropriate project managers and field personnel.

Concentrations of metal contaminants measured in unfiltered groundwater represent the total metals present in the sample. Filtered samples represent dissolved metals concentration and are often more representative of mobile contamination (see exceptions below). Monitoring wells sometimes produce turbid water (water containing suspended solids). The turbidity can be due to disruption of the adjacent geologic formations during well purging or poor design and initial development of the well. When particles containing metal species are suspended into the groundwater and are not removed, they dissolve when the sample is preserved to a pH <2. High levels of [illegible] manganese, and iron in unfiltered samples often indicate the presence of these particles. Without [illegible] concentrations of this mobile metal contamination in the groundwater are often over estimated. Therefore, it is necessary to take both filtered and unfiltered samples to fully characterize the distribution of metals at a given site. Since acid (low pH) may distort the distribution of metals between particulate and dissolved species, preservation for dissolved metals samples must be performed after filtration. Because the [illegible] affects the solubility of metals, filtration must occur immediately after sampling.

The exceptions to the policy requiring both filtered and unfiltered samples are:

1. Site specific geologic conditions where groundwater may transport large particulates and [illegible] samples are representative of mobile groundwater quality (for example, karst terrain or clean gravel facies). These site conditions must be fully discussed and documented in the Quality Assurance Project Plan (QAPjP).

2. When there is sufficient historical data (a minimum of four consecutive quarters) from the same monitoring wells that are to be sampled, then these wells may fall into one of the following exception categories:

   a. If the historical information shows that the purging and sampling methods are the same as the methods to be used at future sampling events, then either filtered or unfiltered samples as appropriate to the historical data are acceptable for future sampling in these wells.

   b. If the historical information shows inconsistency between the filtered and unfiltered data, and high levels of aluminum are present in the unfiltered data, only filtered samples are needed.

NOTE: Extrapolation of historical data from a limited number of wells to all the wells at the site is [illegible] without a clearly justified rationale. All deviations from taking BOTH filtered and unfiltered groundwater samples for metals must be fully described and justified in the QAPJP.

TECHNICAL GUIDANCE FOR FILTRATION OF MONITORING WELL SAMPLES FOR METALS ANALYSIS

1. Designate an area in which the [illegible]tion process is to take place. This area must have an element and dust-free environment. When filtering [illegible]pparatus is not in use, keep it covered to protect from airborne particles. Use either a glass or plastic [illegible]pparatus. Stainless steel is unacceptable since it can contaminate the samples.

(over)

2. Filtration must be initiated immediately after sample collection. Record both the time of sample collection and time of filtration in the field notebook. Filtration must be completed before preservation to a pH <2.

3. 0.45 micron filter is the required pore size for filtration. Other pore-size filters may be appropriate for site specific conditions. However, deviations from the 0.45 micron pore size must be justified and documented in the QAPjP and field notebook. The polycarbonate membrane type is recommended. For highly turbid water, a clean glass fiber filter may be used as a "pre-filter". When a pre-filter is used, place it on top of the 0.45 micron filter, then filter the sample using the normal procedure. Dispose of the pre-filter and record a general description of the turbidity of the sample in the field notebook.

4. Each filter and filtration apparatus must be prepared before use since they often contain trace amounts of metals. Filtration with approximately 20 ml of a 25% nitric acid (HNO_3) solution (3 parts water and 1 part acid) followed by three 20 ml rinses of trace metal free deionized (DI) water is required to remove any trace amounts of metals. The filtered liquid is then discarded before filtering each sample. Use the same DI water and dilute nitric acid solution (i.e., prepared from the same source, lot number and/or batch) to prepare the filters for all samples and the field blanks.

5. Both a filtered and an unfiltered blank must accompany samples to the lab(s) for analysis unless only unfiltered samples are collected and submitted for analysis. A duplicate filtered and unfiltered sample is also recommended.

6. All water samples, including surface water, filtered and unfiltered groundwater, and blanks must be preserved to a $pH < 2$ with HNO_3. Use a high quality acid such as Baker Instra-Analyzed or equivalent. NOTE: Reagent grade acid is not acceptable. Verify that the pH of each sample is <2 with narrow range (0 to 2) pH paper.

7. Document the lot number and manufacturer of the acid, the deionized water, and the filters in the field notebook. This documentation will facilitate tracing the source of contamination when the data indicates the possibility of a contamination problem.

8. Monitoring wells with a very high concentration of solids (evidenced by a slow filtration rate) should be noted in the field notebook. This may indicate an improperly installed monitoring well.

DATA INTERPRETATION

The concentration of a dissolved metal (filtered sample) should not exceed its concentration as a total metal (unfiltered sample). If the dissolved fraction exceeds the total fraction by a small amount, it may be attributable to analytical variability. Typical problems and their possible causes are listed below:

1. The dissolved concentration is higher than the total:

   - When dissolved iron, zinc, aluminum, and copper are higher, then the filters may be a source of contamination. Investigate the rinsing procedure used for filters.

   - When nearly all dissolved metals are higher, then sample mislabeling is a possible source of error. Investigate the sample labeling procedure.

2. If the sample results are erratic, investigate the time lapse from sampling to filtration.